ESCI 571 - DATA SCIENCE TOOLS AND METHODS
COURSE SYLLABUS – SPRING 2021
THURSDAYS 6:00PM -8:30PM

BASIC INFORMATION

Instructor's name: Dr. Oner Celepcikay
Classroom: Online (using Zoom Link on Canvas)
Class Time: Thursday 6:00pm – 8:15pm
Office location: Online
Office hours: Thursdays 4:00pm-5:30pm (by appointment)
Phone Number: 713-966-9354
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COURSE DESCRIPTION

With the recent advances in data collection, storing and analysis technologies and methods, most businesses and institutions recognizes data as the most vital asset of an enterprise, even some states; “data is the new oil”. Oil & Gas companies are no different. If anything as an industry, Oil & Gas is behind the high tech and retail industry in terms of utilizing data through Data Science to achieve competitive advantage. In any organization data is the main foundation of information, knowledge and ultimately the wisdom for correct decisions and actions.

This course covers concepts, techniques and tools they need to deal with various facets of data science practice, including exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication. This course covers the foundations, methodology, main algorithms and tools for data science to help students acquire practical knowledge of using Python and Data Science libraries and their potential applications in Energy Industry.

COURSE OBJECTIVES

At the end of this course, students will:

- Learn what Data Science is and the skill sets needed to be a data scientist
- Acquire practical knowledge of using Python and Data Science libraries
- Learn about the potential applications of Data Science in the Oil & Gas industry
- Gain practical knowledge of the Data Science Process using Classification and Clustering.

COURSE SCHEDULE:

This syllabus is only a guide for the course and is subject to change with advanced notice.

Week	Date	Topic
1	01/28/2021	Introduction to Course and Intro Data Science I
2	02/04/2021	Data Science Methods I – Classification I
3	02/11/2021	Data Science Methods I – Classification II
4	02/18/2021	Data Science Tools II – Clustering
5	02/25/2021	Data Science Tools 4 – Association Rule Mining Data Science Methods 2- K-Nearest Neighbor (KNN)
6	03/04/2021	Python for Data Science using Jupyter Notebooks I – **Lab**
7	03/11/2021	Midterm Exam
8	03/18/2021	Python for Data Science using Jupyter Notebooks II-**Lab**
9	03/25/2021	Classification using Python (Decision Trees) – **Lab** Clustering using Python Libraries (K-Means) – **Lab**
10	04/01/2021	Group Research Project Presentations
	04/08/2021	Spring "Sprinkle" Day - No Class
11	04/15/2021	Data Science Tools 5 – Regression Analysis Regression using Python Libraries – **Lab**
12	04/22/2021	Final Project Team Presentations & Demos
13	04/29/2021	Other Data Science Methods Big Data & Cloud-based Data Science

COURSE PREREQUISITES

None

REQUIRED TEXTBOOK

There is no required textbook. We will have recommended reading throughout the semester.

COURSE TOPICS TO BE COVERED

1. **Introduction to Data Science**
   - The role of Data in 21st Century
   - Best Practices from various industries utilizing Data Science Tools
   - Motivation behind Data Science in the era of Big Data and Cloud Computing
2. **Data Science in Oil & Gas**
   - Why Oil & Gas Data is different
   - Opportunities and Challenges of applying Data Science in Oil & Gas Industry
   - Data Science Applications from the industry
3. **Python for Data Science using Jupyter Notebooks**
   - Introduction to Jupyter Notebooks
   - Python Syntax, Functions, Variables, Lists, Dictionaries
   - Python Libraries; numpy, pandas, matplotlib, seaboard, scikit learn
4. **Data Science Tools**
   - Classification Concepts
   - Classification Case Study: Decision Tress
   - Clustering Concepts
   - Clustering Case Study: K-Means
   - Hands-on Labs using Python Libaries
5. **Data Management in the era of Big Data and Cloud**
   - Data Science and machine Learning for Data Management

EVALUATION PROCEDURES AND GRADING CRITERIA

Students will be evaluated and will receive grades using following.

Activity	Weight
Labs & Lab Assignments	25%
Midterm Exam	20%
Group Research Paper & Presentation	20%
Final Project	25%
In class Participation	10%

Your final course grade will be determined by following standard college formula:

90-100→"A", 80-89→"B", 70-79→"C", 60-69→"D", 0-59→"F"

RICE HONOR CODE:

All students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. If you have questions about what plagiarism, proper citations for group work, etc. there is no shame in asking: ignorance is not an excuse for failing to uphold academic integrity.

DISABILITY SUPPORT SERVICES:

If you have a documented disability or other condition that may affect your academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me as early as possible in order to support you in meeting course expectations.